

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 March 2003 (20.03.2003)

PCT

(10) International Publication Number
WO 03/022464 A2

(51) International Patent Classification⁷: **B08B 3/00**

(21) International Application Number: PCT/DK02/00575

(22) International Filing Date:
5 September 2002 (05.09.2002)

(25) Filing Language: Danish

(26) Publication Language: English

(30) Priority Data:
PA 2001 01319 7 September 2001 (07.09.2001) DK

(71) Applicant (*for all designated States except US*): **GUN-
CLEAN TOFTEJORG AB** [SE/SE]; P.O. Box 8763,
Salsmästaregatan 21, S-402 76 Göteborg (SE).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **FALSTER-
HANSEN, Henrik** [DK/DK]; Skovvejen 37, DK-4340
Tølløse (DK). **ELGAARD, Ib, René, Vinther** [DK/DK];
Saunte Bygade 22, DK-3100 Hornbæk (DK).

(74) Agent: **LARSEN & BIRKEHOLM A/S**; Skandinavisk
Patentbureau, Banegårdspladsen 1, P.O. Box 362, DK-1570
Copenhagen V (DK).

(81) Designated States (*national*): AE, AG, AL, AM, AT (util-
ity model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (util-
ity model), DE, DK (utility model), DK, DM, DZ, EC, EE

(utility model), EE, ES, FI (utility model), FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,
LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD,
SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO utility model (GH),
ARIPO patent (GH), ARIPO utility model (GM), ARIPO
patent (GM), ARIPO utility model (KE), ARIPO patent
(KE), ARIPO utility model (LS), ARIPO patent (LS),
ARIPO utility model (MW), ARIPO patent (MW), ARIPO
utility model (MZ), ARIPO patent (MZ), ARIPO utility
model (SD), ARIPO patent (SD), ARIPO utility model
(SL), ARIPO patent (SL), ARIPO utility model (SZ),
ARIPO patent (SZ), ARIPO utility model (TZ), ARIPO
patent (TZ), ARIPO utility model (UG), ARIPO patent
(UG), ARIPO utility model (ZM), ARIPO patent (ZM),
ARIPO utility model (ZW), ARIPO patent (ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES,
FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR),
OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:

-- *without international search report and to be republished
upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: CLEANING EQUIPMENT AND USE THEREOF

(57) Abstract: By constructing tank cleaning equipment according to the invention such that it comprises a cleaning jetting part (7, 9) as well as a suction part (4), the equipment can work with the same cleaning medium which is recirculated. This saves supply of fresh cleaning medium, and since used medium is thus not discharged, it is not necessary to establish deposit facilities to avoid pollution. Furthermore, this equipment according to the invention may advantageously be used for keeping so-called drilling mud in a mixed and thus ready-to-use state, even when left to stand for an extended period of time in a tank. The nozzle jets (10) thus keep the mud in the tank in a constantly mixed state, and the mud can therefore be sucked through the suction pipe (20) for pumping in the drill pipe, it being ensured that the mud is homogeneous and has a suitable viscosity.

WO 03/022464 A2

CLEANING EQUIPMENT AND USE THEREOF

State of the art

- 5 The invention relates to cleaning equipment for the cleaning of a tank space by means of pipe lowered into the tank space with cleaning equipment comprising a revolving cleaning head with rotating nozzles, and from which cleaning medium is discharged, as well as use of the equipment.
- 10 Cleaning equipment of this type is used in particular for the cleaning of various forms of tank spaces for use in process technology, the food industry as well as storage tanks.
- 15 Cleaning takes place by means of flushing from rotating and revolving nozzles so that the entire internal surface of the tank space is flushed. Material settled on the tank wall and the cleaning medium must subsequently be pumped out and collected. This cleaning medium with suspended material is frequently a problem, since it must be stored for subsequent cleaning in order to avoid pollution. To this should be added that this cleaning process
- 20 must be supplied with an uninterrupted flow of cleaning medium, which requires a considerable amount of cleaning liquid.

- This is a drawback where limited amounts of cleaning medium are available, such as on drilling platforms and similar locations, just as it requires a
- 25 sufficient tank capacity for the storage of the cleaning medium pumped out.

Object of the invention

- 30 The object of the invention is to remedy these drawbacks and defects, and this is achieved according to the invention by cleaning equipment, where the cleaning equipment additionally comprises a suction pipe extending

from the bottom of the tank space and out of the tank space, said suction pipe being connected with the suction side of a pump, while the delivery side of the pump is connected with the nozzles of the cleaning head.

5 Cleaning of tank spaces may be carried out in this surprisingly simple manner by recirculating the cleaning medium. In this manner, the amount of cleaning medium is limited, and the problem of discharging polluted medium is effectively remedied, since the cleaning medium may be re-used.

10 If the cleaning medium is cleaned, e.g. in that coarse particles are filtered off in a filter, the cleaning medium may be re-used several times.

15 When, as stated in claim 2, the equipment is constructed such that it may be mounted in one and the same hole in the tank, the installation is very compact, and the mounting is therefore simpler and less expensive.

20 When, as stated in claim 3, the suction pipe is constructed such that it may be adjusted in height from the outside, the same equipment may be adapted to various tank dimensions.

25 When, as stated in claim 4, the cleaning medium is recirculated, it may be used in locations where a limited amount of cleaning medium is available, and where discharge of polluted cleaning medium is not allowed.

30 Finally, it is expedient, as stated in claim 5, to use the equipment to ensure a homogeneous and fluid drilling mud which is used for lubrication and pressure seal-off around the drill in the drill pipe.

The drawing

30

An example of an embodiment of the equipment according to the invention

will be described more fully below with reference to the drawing, which shows a section through a tank with the equipment mounted.

Description of the example of an embodiment

5

The drawing shows an example of a preferred embodiment of the equipment according to the invention.

10

The tank in which the equipment is mounted is indicated with an upper and lower tank wall 1.

The top of the tank is formed with a hole at which a flange 2 is mounted.

15

A cover 3 is secured to this flange 2. Where the equipment is not mounted, the cover is a so-called closed cover, which is fixedly bolted in a generally known manner.

20

When the cleaning equipment is to be mounted, the cover is removed, and the cover 3 shown in the drawing is mounted, through which a cleaning pipe 4 as well as a suction pipe 20 may be passed.

25

The cleaning pipe 4 is normally welded to the cover 3, protruding a distance above the cover and such that a drive means (not shown) for a coupling member 6 may be mounted

Furthermore, a supply stub 12 for the supply of cleaning medium under pressure is provided.

30

A valve 13 controls the supply of this medium.

The cleaning pipe 4 internally mounts a drive shaft which, via the drive

equipment, can revolve the cleaning head 7 mounted at the end such that the cleaning head revolves as indicated by an arrow 8.

5 The cleaning head 7 is moreover provided with rotating nozzles 9 which rotate in the direction of the arrow 11 during cleaning at the same time as the cleaning head revolves.

The cleaning medium is fed to the pipe 4 and is discharged through the nozzles 9 to form the cleaning jets 10.

10

When cleaning takes place, the cleaning head revolves while the nozzles rotate, which results in a great cleaning effect and provides the certainty that all internal faces are swept uniformly by the cleaning medium.

15 Also a suction pipe 20 is passed through the cover and is mounted with a longitudinal key 21 secured at the side and extending in a keyway 22 in the cover 3. In addition, a plurality of guides 19 for the suction pipe 20 are secured on the cleaning pipe 4.

20 A raising/lowering system e.g. in the form of a spindle 24 is mounted such that the suction pipe 20 may be displaced relative to the cover and thereby relative to the tank space.

25 The purpose of this height adjustability is to adjust the suction end of the suction pipe 20 relative to the bottom of the tank.

As indicated in the drawing, a bellows member 17 may be mounted for accommodating any movement in the longitudinal direction, just as a hopper 16 with inlet holes 15 on the circumference is mounted.

30

The suction pipe 20 protrudes a distance above the cover 3 and is provided

with a hose coupling member 23 at the end.

5 By means of this, a suction hose may be connected to a pump 14, said pump being connected with the cleaning pipe 4 at the delivery side, so that cleaning medium may be discharged via the nozzles 9 into the tank space.

The cleaning medium will be recirculated in a completely closed circuit during the cleaning.

10 As needed, a filter arrangement (not shown) may be inserted in a generally known manner between the suction side and the delivery side so that at least a coarse filtration takes place.

15 In this manner, the same cleaning medium may be re-used, thereby obviating the need for a constant supply of fresh cleaning medium and also the need for collection/discharge of used and dirty cleaning medium.

Moreover, it has been found that the equipment is extremely suitable for use in tanks in which so-called drilling mud is stored.

20 This drilling mud consists of clay and specially developed chemicals which are mixed with water and/or oil.

25 It is used for lubricating the movable parts of the drill head and for flushing the loosened subsoil material away from the drill head. It moreover forms a sealing layer between the drill and the drill pipe when it is pumped in the drill pipe.

30 The problem of this drilling mud is that at standstill it tends to disintegrate into components where the heavy parts will precipitate. The drilling mud cannot be used in this state, as it functions only when it is in a homoge-

neous state.

It has surprisingly been found that the drilling mud may advantageously be deposited in a tank in which equipment corresponding to the cleaning
5 equipment described above is mounted.

In this use, mixing water/oil must be supplied to the cleaning equipment, which will keep the drilling mud suitably mixed and conditioned by its nozzle movement. At the same time, drilling mud ready for use may be sucked out
10 via the suction pipe, and may then be pumped down into the drill pipe, the drill string.

This saves a considerable amount of work, as the mixed drilling mud, which is left to stand for an extended period of time, may be kept mixed and ready
15 for use.

PATENT CLAIMS

1. Cleaning equipment for the cleaning of a tank space by means of a pipe lowered into the tank space with cleaning equipment comprising a revolving
5 cleaning head with rotatable nozzles, and from which cleaning medium is discharged, c h a r a c t e r i z e d in that the cleaning equipment additionally comprises a suction pipe (20) extending from the bottom of the tank space and out of the tank space, said cleaning pipe (20) being connected with the suction side of a pump (14), while the delivery side of the pump is
10 connected with the nozzles (9) of the cleaning head (7).
2. Cleaning equipment according to claim 1, c h a r a c t e r i z e d in that both the suction pipe (20) and the lowered pipe (4) of the cleaning equipment extend through the same opening in the tank wall (1).
- 15 3. Cleaning equipment according to claims 1 and 2, c h a r a c t e r i z e d in that the suction pipe (20) is provided with means (24) for height adjustment (18) of the inlets (15, 16) of the suction pipe (20) into the tank space.
- 20 4. Use of the cleaning equipment defined in claims 1-3, c h a r a c t e r i z e d in that it is used for the cleaning of a tank space by recirculation of the cleaning medium (10, 11) in a closed system.
- 25 5. Use of the equipment defined in claims 1-3, c h a r a c t e r i z e d in that it is used for the preparation (conditioning) of drilling mud for use in drill pipes in the extraction of oil/gas, where the drilling mud is discharged from the delivery side of the pump (14), while the cleaning equipment receives liquid (10) which, via the nozzles (9), keeps the mud mixture mixed.

